

Alaska Space Grant Consortium
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PROGRAM DESCRIPTION

The National Space Grant College and Fellowship Program consists of 52 state-based, university-led Space Grant Consortia in each of the 50 states plus the District of Columbia and the Commonwealth of Puerto Rico. Annually, each consortium receives funds to develop and implement student fellowships and scholarships programs; interdisciplinary space-related research infrastructure, education, and public service programs; and cooperative initiatives with industry, research laboratories, and state, local, and other governments. Space Grant operates at the intersection of NASA's interest as implemented by alignment with the Mission Directorates and the state's interests. Although it is primarily a higher education program, Space Grant programs encompass the entire length of the education pipeline, including elementary/secondary and informal education. The Alaska Space Grant Consortium is a Program Consortium funded at a level of \$430,000 for fiscal year 2013.

PROGRAM GOALS

Outcome 1: Contribute to the Development of the STEM Workforce (Employ and Educate)

Diversity:

Goal: Encourage participation of female and underrepresented minority students and faculty in Alaska Space Grant Programs.

Objectives:

1. Work to engage our minority population at the Affiliate institutions through American Indian Science and Engineering Society (AISES), Alaska Native Science and Engineering Program (ANSEP) and our Affiliate representatives. Add at least one additional minority fellowship/scholarship application per year until we reach or exceed our stated minority goal.
2. Expand our affiliate organization to include the minority serving rural campuses within the UA system and Ilisagvik College, Barrow, AK. Add one new minority affiliate/year until all Higher Ed campuses in Alaska are represented.
3. Recruit at our rural campuses for summer fellowships to NASA and to our main campus's. Obtain at least one minority student application from a rural campus/year.

Fellowship/Scholarship Program:

Goal: Provide a program that supports workforce development by pumping the STEM "pipeline" through offering a sequence of competitive scholarship (to engage students

early in their career) and fellowship (to provide “authentic” research and engineering experiences) opportunities to Alaskan students from diverse populations in STEM, and related education disciplines at Affiliate member institutions. Fellowship/scholarships will be provided equitably across the state with an emphasis on achieving and maintaining diversity in numbers of applicants and awardees.

Objectives:

1. Recruit at least one applicant per year for an internship or summer program at a NASA center. By 2011 recruit at least one applicant per 4 year affiliate institution per year.
2. By spring 2011 the “Student Opportunities in Alaska” webpage connecting students to NASA “relevant” research projects and faculty will identify opportunities at every 4 year institution.
3. Each year, at least one early career scholarship will be awarded at each affiliate institution to a freshman, sophomore or a student transitioning from a rural campus to a 4 year degree program.
4. Every year, at least one fellowship will be awarded at each affiliate institution that has a 4 year STEM degree program or to a rural student performing summer research at an affiliate 4 year degree institution.
5. At least one additional fellowship/scholarship will be awarded per year to an appropriate minority applicant until we reach or exceed our stated minority goal.

Research Infrastructure Program:

Goal: Provide research initiation grants in strategic areas to improve collaboration between Alaska and NASA researchers and to improve the ability of Alaskan researchers to compete for NASA research and development work.

Objectives:

1. At each Affiliate institution identify and support expertise in areas of interest to NASA. By 2012 at least one strategic area of interest will be identified at every Affiliate institution with a 4 year STEM degree program.
2. Build capacity and expertise in the aerospace program at UAF to successfully respond to NSF and NASA solicitations for small satellite missions. By 2012 a small satellite proposal will be submitted.
3. Provide a venue for researchers across the state to meet and develop inter-institutional collaborations. The Alaska Space Grant first annual symposium will be held in May 2010. At least one collaborative research infrastructure project will be awarded by 2012.

Higher Education Program:

Goal: Provide support for interdisciplinary team activities and events that act to synthesis a student’s degree program and connect students to NASA higher education programs. Provide support for curriculum development/modification for the inclusion of NASA relevant topics.

Objectives:

1. By 2012 create an “Alaska Space Grant Grand Challenge” competition with teams at each of our rural affiliate institutions to provide “authentic” research and/or engineering experiences on our minority serving campuses.

2. In 2010, Alaska Space Grant will host their first annual symposium where students may present their research projects. In 2010, 50% of all students receiving fellowship awards or participating in Alaska Space Grant supported higher education activities will present their work either at the Alaska Space Grant Symposium or at some other professional conference. By 2015 over 90% of these students will be presenting their work.
3. Promote NASA higher education programs at our affiliate institutions. At least one student or team will participate in a NASA higher education program every year.
4. Continue to support NASA relevant Higher Education programs at each Affiliate institution that contribute to the overall employment rate in STEM fields. 90% of all students participating in Higher Education programs will continue to graduate school, a career in STEM field, or pre-college teacher training.

Outcome 2: Attract and Retain Students in STEM Disciplines (Educate and Engage)

Precollege Program:

Goal: Provide support for Alaska pre-college STEM education with emphases on NASA content, teacher training, and delivery to underrepresented group.

Objectives:

1. Increase the STEM content knowledge of Alaska's pre-college teachers through teacher professional development. All ASGP sponsored professional development programs will show increased STEM content knowledge.
2. Support rural teacher professional development with summer programs and/or distance delivery programs. At least one professional development project/class targeting rural teachers will be supported each year.
3. Support standards based curriculum development in STEM fields connecting NASA relevant materials to the classroom. All curricula will be standards based and be freely available through the ASGP and/or our affiliate's website.
4. Provide limited support for student involvement activities to inspire interest in STEM fields and careers that specifically target underrepresented students. Each student involvement activity will show increased interest in pursuing STEM education and/or careers.

Outcome 3: Build strategic partnerships and linkages between STEM formal and informal education providers (Engage and Inspire)

Informal Education Program

Goal: Provide support for professional development of informal education providers and informal education programs that use NASA themes and content and/or Alaska Native "ways of knowing" to enhance participant awareness and knowledge of NASA mission activities, STEM disciplines and career opportunities.

Objectives:

1. Connect informal education providers to NASA relevant research conducted in Alaska through the Alaska Space Grant Symposium to collaboratively develop Alaska/NASA specific informal education programs and professional development opportunities. Identify at least one new informal education activity each year.

2. Facilitate at least one annual training session to equip informal science educators with the knowledge and skills needed to deliver NASA aerospace content that will effectively engage large numbers of participants.

PROGRAM/PROJECT BENEFIT TO OUTCOME (1,2, & 3)

Student NASA Summer Fellowship (Outcome 1: Fellowship/Scholarship Objective 1)

The best learning experiences are the ones that teach us something new about ourselves. For Thomas Edwards, a physics student and UA scholar, his internship at NASA during the summer of 2013 proved to be just such an experience.

During his internship as part of the Langley Aerospace Research Student Scholars (LARSS) project, Edwards worked alongside Dr. Daniel Weimer, a space physics expert. While the project Edwards worked on was small and in a sub-field of physics he lacked experience in, he was able to take the project and make it his own. "It was a real confidence booster," he said.

Over the summer, Edward's had the opportunity to see how NASA worked from the inside, as well as what research was being actively pursued. The internship gave Edwards the chance to be a fly-on-the-wall at one of the nation's great research institutes, while also getting his hands dirty in the heady world of physics.

Edwards was also impressed with the LARSS program staff, adding that they were fantastic and supportive. They were also understanding, allowing him to enter the program a few weeks later to accommodate Edwards' early summer plans. He meshed well with his roommates and made sure to have fun outside of NASA on the weekends. Overall, he was floored by the internship. "The experience was great!" he said.

For Edwards, the internship was a summer-long field test of his skills and research ability. He jumped into an unknown research environment and landed skillfully on the other side. "I came out of it feeling accomplished and confident," Edwards said.

In addition to studying physics, Edwards is also minoring in computer science and mathematics. With most of Edwards' work being in numerical simulation, he often has the chance to bring all three fields together. At the end of the day, Edwards takes pleasure in solving problems. "There's a certain rush you get when you finally get a simulation working and producing results no one has ever seen before," he said.

In the near future, Edward's will finish a research project with UAF professor Dr. Channon Price, while also applying for graduate school. He intends to work toward a PhD in either physics or engineering. Staying true to his passion, Edwards hopes to find a program with a heavy numerical modelling focus. Edwards will graduate from UAF in May 2014.

PROGRAM ACCOMPLISHMENTS

Outcome 1: Contribute to the Development of the STEM Workforce (Employ and Educate)

A discrepancy in definition of reporting “year” was discovered in the process of writing this report. Because of this discrepancy, percentages of student engagement were not consistently reported in previous years. This report uses a reporting year as 6/1/2013 – 5/31/2014 for FY13. Based on this definition student numbers for fellowships and scholarships are accurately reported. However, student engagement in Higher Education projects, which are not provided until end of year reports, are not accurately reported in this document. The Higher Education student engagement numbers will be accurately reported through OEPM. Previous year’s numbers have been adjusted to reflect a commensurate reporting year, i.e. FY10 “year” is 6/1/2010 – 5/31/2011, etc. All reported percentages have been recalculated back to 2008.

Diversity: This section reflects total diversity in the program with respect to student engagement in Fellowships, Scholarships, Higher Education projects, and Research Infrastructure projects. Note that Alaska Space Grant primary focus from 2008 to 2011 has been to increase diversity in fellowship and scholarship (FS) awards. Only since 2011 have we begun to address diversity in Higher Education (HE) projects and Research Infrastructure (RI) awards. In FY13 (i.e. 6/1/2013 – 5/31/2014) our total student engagement (not including HE) was 37.9% woman (28% - FS, 100% - RI) and 34.5% minority (36% - FS, 25% - RI). This is compared to previous year’s total student engagement (including HE) for commensurate years of 37.0% women (34.5% - FS, 41.7% - HE, 38.4% - RI) and 9.3% minority (17.2% - FS, 0% - HE, 0% - RI) in FY12; 48.0% women (54.5% - FS, 41.7% - HE, 20% - RI) and 16% minority (24.2% - FS, 0% - HE, 0% - RI) in FY11; 49.0% women (52.3% - FS, 20% - RI) and 22.4% minority (25% - FS, 0% - RI) in FY10; 37.0% women (36.4% - FS, 100% - RI) and 10.9% minority (11.4% - FS, 0% - HE, 0% - RI) in FY09; 71.4% women (71.4% - FS) and 7.1% minority (7.1% - FS) in FY08. For 2013 Diversity Objective 1 was met for FS awards and RI awards. Two scholarship awards were given to students at a rural campus (Diversity Objective 3)

Fellowship/Scholarship Program: 4 NASA internship applications (UAF, UAS: FS: Objective 1 partially met), 1 selected by NASA, 0% female, 0% minority. Awarded: fellowships 18 applications, 11 awards (APU, UAA, UAF, UAS: FS Objective 4 met), 9.1% female, 9.1% minority; scholarships 34 applicants (UAA, UAF, UAS, rural: FS Objective 3 mostly met) 14 awards, 42.8% female, 57.1% minority. Cumulative rate of fellowship/scholarship awards in underrepresented minorities in FY2013 was 36% (FS Objective 5 met) (compared to 17.2% in FY12; 24.2% in FY11; 25.0% in FY10; 11.4% in FY09; 7.1% in FY08)

Research Infrastructure: 5th annual Alaska Space Grant/NASA EPSCoR Education and Research Symposium will be held in Juneau April 2014 (RI Objective 3 partially met). The Research Infrastructure program was restructured in 2013 to award research fellowships to graduate students working on NASA relevant research rather than providing mini-grants to faculty. Since this was a transition year we still awarded 1 Research Infrastructure faculty mini-grant (UAF) and 4 graduate research fellowships (7 applications), 100% female, 25% minority. The Higher Education Space Systems

Engineering program has grown in Research capacity to facilitate the submission of a small satellite proposal this year (RI Objective 2 will be met this year!). RI Objective 1 is still not met for all affiliate institutions.

Higher Education: 5th annual Alaska Space Grant/NASA EPSCoR Education and Research Symposium will be held in Juneau April 2014. 90.9% of undergraduate research fellowships and 100% of graduate research fellowships presented in 2013 (HE Objective 2 met). Longitudinal tracking of participating students for FY13 will be compiled this summer after graduation. In FY12, 76.5% of students taking the “next step” stepped into graduate school, a STEM profession, or pre-college teaching (HE Objective 4 not met). Three affiliates (APU, UAF, UAS) conducted hands-on authentic research and/or engineering experiences that include NASA relevant topics either through revised/developed courses or extra-curricular programs (HE Objective 3 mostly met). One new course was developed at APU. Finally a new project was initiated this year “Rural Flight Challenge” which partners Alaska Native engineering students with their home public school to present a STEM curriculum on remote controlled aircraft design.

Outcome 2: Attract and Retain Students in STEM Disciplines (Educate and Engage)

Precollege Program: 2 Pre-college projects were funded in FY13 (PC Objective 1 met). “Encounter Earth” is a teacher training project directed towards middle and high school teachers focusing on integrating NASA data and experiences into the classroom through the newly updated “Encounter Earth” simulated space mission at the Challenger Learning Center. “The Monster Lobe: A Real World, Alaskan STEM Design Project for Middle School Classrooms” has created an online course (EDMA693 Special Topics: STEM in the K-8 Classroom) at UAS (PC Object 2 met) which is supporting a new STEM certificate for teachers.

Outcome 3: Build strategic partnerships and linkages between STEM formal and informal education providers (Engage and Inspire)

Informal Education Program: Through a Board of Directors and Affiliate representative joint decision, Information Education projects are no longer directly funded. Rather all funded students and projects are encouraged to seek out opportunities to participate in informal activities to showcase their specific research. For example, students in the UAF Space Systems Engineering Program presented their satellite design project at the Alaska Summer Research Academy (high school summer camp on UAF campus), provided hands-on activities (rocket building) to families attending the 2014 Engineering Open House, supported design and build projects in local public school classroom at Wood River Elementary. Other informal education activities will be compiled for FY13 through the end of year project reports.

PROGRAM CONTRIBUTIONS TO NASA EDUCATION PERFORMANCE MEASURES

- **Student Data and Longitudinal Tracking:** FY13 longitudinal tracking numbers will not be available until June 2014. Reported here are the longitudinal tracking numbers for FY12 (6/1/2012 – 5/31/2013). Total awards = 54; Fellowship/Scholarship = 29, Higher Education/Research Infrastructure = 25; 5 of the total awards are underrepresented minority F/S funding; 5 students are employed in a STEM field, 1 is

employed in a STEM position in an aerospace industry, 2 are pursuing an advanced degree, and 1 is employed in “other” STEM academic field. Additionally 4 students are employed in a non-STEM field while 4 are seeking STEM employment.

- **Minority-Serving Institutions:** College of Rural and Community Development (CRCD) is an Alaska Native minority serving college within UAF, that acts as the umbrella College for multiple rural campuses. No proposals were received from CRCD in FY13. However a new Higher Education project was initiated to partner Alaska Native engineering students with their home public school to present a STEM curriculum on remote controlled aircraft design.

- **NASA Education Priorities:**

Authentic, hands-on student experiences: APU, UAF, and UAS each conduct hands-on authentic research and/or engineering experiences that include NASA relevant topics through space grant funded higher education projects.

Discovering the role of cryobiota in glacial melt on an Alaskan icefield (APU): This project developed a new field course on glacial ecology for 2014 with a curriculum based on student-driven, manipulative experiments. The primary goal of the course is to experimentally test hypotheses concerning fundamental aspects of glacial ecology in south central Alaska.

Space Systems Engineering Program (UAF): provides interdisciplinary students with hands-on experience in all aspects of space systems engineering through a design, build, launch paradigm applied to balloon and rocket payloads and small satellites. We have been manifested (finally) on a launch and are working to prepare our satellite for delivery. Additionally, our expertise has grown to facilitate our submission of a small satellite research proposal this year!

2013 Geoscience Field Studies Support (UAS): provides continued support for students to participate in a summer semester glaciology field course on the Juneau Ice Field (JIRP) and a 3 day field experience with the Friends of the Pleistocene (FOP). Both of these experiences explore, conduct, and showcase research in active surface processes, glaciation, and climate science in Alaska, the Yukon, and northern British Columbia.

Diversity of institutions, faculty, and student participants: Alaska Space Grant Program is comprised of affiliate institutions, which includes all major four year campuses in Alaska (APU, UAA, UAF, UAS) plus five Alaska native serving (community) campuses (CRCD), that represent 90% of the students in the state of Alaska. Gender and underrepresented diversity fluctuates year to year. Our cumulative averages (FY08-FY13) are 44.4% female and 20.6% minority in our undergraduate fellowship/scholarship awards. We are working on improving our diversity engagement in institutions and student participation in Higher Education programs and where applicable in our Research Infrastructure graduate research fellowship program.

Engage middle school teachers in hands-on curriculum enhancement: Both our pre-college projects this year are directed towards engaging middle school teachers in hands-on curriculum enhancement capabilities. See above for description of the projects.

Community Colleges: ASGP affiliate, the college of Rural and Community Development (CRCD) acts as an umbrella institution for five Alaska Native minority

serving rural campuses and one community campus in Fairbanks. No projects were supported at CRCD this year.

Environmental Science and Global Climate Change:

Most of the research infrastructure and higher education projects as well as several undergraduate research fellowship awards supported by Alaska Space Grant touch on issues surrounding Environmental Science and Global Climate Change. These are important topics for the state of Alaska as the rapid climatic change in the arctic is intimately apparent. This year's topics include: Patterns and Potential Solutions to Coastal Geohazards in Northwest, Alaska; How sea ice parameters influence the Alaskan epibenthic community variability; Characterizing fabric associated with folding in the Greenland NEEM ice core; Age Model Construction of Lacustrine Cores and Seismic Profiles; Autonomous Underwater Vehicle Aided Structural Health Monitoring in Arctic and Subarctic Climates; Antifreeze Peptides in Antarctic Soils; Volume and Mass Balance changes in Land-terminating, Tidewater, and Lake-terminating Glaciers in Southern Alaska.

Enhance capacity of institutions to support innovative research infrastructure: We supported 4 graduate research fellowships to support the growth of NASA relevant research in Alaska. Through our Space Systems Engineering Program we have grown our small satellite research capability and will be submitting a small satellite proposal this year. Alaska Space Grant Program continues to work with CRCD, UAA, and UAS to increase their proposal submission rate.

IMPROVEMENTS MADE IN THE PAST YEAR

- Added a representative from UAA to our Board of Directors. We now finally have representation on our Board of Directors from UAA, UAF, and UAS.
- Developed new project reporting forms to our awardees to align with the new OEPM reporting requirements.
- Trip-wire put in place to monitor minority engagement was tripped in FY12. This caused the ASGP management team to re-invigorate our recruitment of minority students. FY13 minority numbers reflect that effort.
- Discovered discrepancy in how student numbers were being reported with respect to reporting year. All student data were re-analyzed for this report back to 2008. Student data are now reported from June 1 to May 31 for example June 1, 2013 to May 31, 2014. Implications of this choice is that undergraduate fellowship and scholarships, and graduate fellowships awarded during that time period are accurately reported. Since student numbers for Higher Education projects are not known until the end of year report, those numbers are not accurately reported in this document, but are accurately reported in OEPM.
- Changed the Research Infrastructure program to support graduate student research fellowships rather than faculty seed grants (which are funded through Alaska NASA EPSCoR). This has improved our ability to recruit minority students at the graduate level.

PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

- **University of Alaska Fairbanks (UAF)** – Lead institution, research center for the statewide university system, and only PhD granting institution in the state of Alaska. *Participates in fellowship/scholarship, research infrastructure, higher education programs this year.*
- **University of Alaska Anchorage (UAA)** – Urban 4-year University serving the population center of Alaska. *Participated in fellowship/scholarship programs this year.*
- **University of Alaska Southeast (UAS)** – Regional 4-year University serving southeast Alaska. *Participates in fellowship/scholarship, higher education and pre-college programs this year.*
- **Alaska Pacific University (APU)** – Private 4-year University focusing on inquiry based learning in environmental sciences. *Participates in fellowship/scholarship and higher education programs.*
- **College of Rural and Community Development** – Community college serving Alaska Native students in rural Alaska. *No applicants from CRCDC for any programs.*
- **Challenger Learning Center of Alaska** – Non-profit corporation focusing on hands-on precollege science programs. *Participates in pre-college programs.*
- **Juneau Economic Development Council (JEDC)** – Non-profit corporation supporting K12 STEM education programs. *Did not participate this year.*

The National Space Grant Office requires two annual reports, the Annual Performance Data Report (APD) and the Office of Education Performance Measurement System (OEPM) report. The former is primarily narrative and the latter data intensive. Because the reporting timeline cycles are different, data in the two reports may not necessarily agree at the time of report submission. OEPM data are used for official reporting.